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|---|------------------------|--|---------|---|--------------|---|-------------|
| AWARD/CONTRACT | | 1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700) | | RATING | | PAGE OF PAGES 1 2 | |
| 2. CONTRACT (Proc. Inst. Ident.) NO. EP-C-17-031/68HERC20F0095 | | | | 3. EFFECTIVE DATE See Block 20C | | 4. REQUISITION/PURCHASE REQUEST/PROJECT NO. PR-ORD-19-02371 | |
| 5. ISSUED BY CODE | | CAD | | 6. ADMINISTERED BY (If other than Item 5) CODE | | | |
| CAD US Environmental Protection Agency 26 West Martin Luther King Drive Mail Code: W136 Cincinnati OH 45268-0001 | | | | | | | |
| 7. NAME AND ADDRESS OF CONTRACTOR (No., street, country, State and ZIP Code) TETRA TECH, INC. Attn: John Hochheimer 10306 EATON PL STE 340 FAIRFAX VA 22030 | | | | 8. DELIVERY <input type="checkbox"/> FOB ORIGIN <input checked="" type="checkbox"/> OTHER (See below) | | | |
| | | | | 9. DISCOUNT FOR PROMPT PAYMENT | | | |
| | | | | 10. SUBMIT INVOICES (4 copies unless otherwise specified) TO THE ADDRESS SHOWN IN | | ITEM | |
| CODE 198549560 | | FACILITY CODE | | | | | |
| 11. SHIP TO/MARK FOR CODE | | ORD DC | | 12. PAYMENT WILL BE MADE BY CODE | | | |
| Office of Research and Development US Environmental Protection Agency 1200 Pennsylvania Avenue, NW MC: 8101R Washington DC 20460 | | | | | | | |
| 13. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION: <input type="checkbox"/> 10 U.S.C. 2304 (c) () <input checked="" type="checkbox"/> 41 U.S.C. 3304 (a) () | | | | 14. ACCOUNTING AND APPROPRIATION DATA See Schedule | | | |
| 15A. ITEM NO | 15B. SUPPLIES/SERVICES | | | 15C. QUANTITY | 15D. UNIT | 15E. UNIT PRICE | 15F. AMOUNT |
| | Continued | | | | | | |
| 15G. TOTAL AMOUNT OF CONTRACT | | | | | | \$71,195.00 | |
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| | B | SUPPLIES OR SERVICES AND PRICES/COSTS | | PART III - LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACH. | | | |
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| CONTRACTING OFFICER WILL COMPLETE ITEM 17 (SEALED-BID OR NEGOTIATED PROCUREMENT) OR 18 (SEALED-BID PROCUREMENT) AS APPLICABLE | | | | | | | |
| 17. <input checked="" type="checkbox"/> CONTRACTOR'S NEGOTIATED AGREEMENT (Contractor is required to sign this document and return _____ copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and on any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award/contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as are attached or incorporated by reference herein. (Attachments are listed herein.) | | | | 18. <input type="checkbox"/> SEALED-BID AWARD (Contractor is not required to sign this document.) Your bid on Solicitation Number 68HERC20R0009 , including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as to the items listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your bid, and (b) this award/contract. No further contractual document is necessary. (Block 18 should be checked only when awarding a sealed-bid contract.) | | | |
| 19A. NAME AND TITLE OF SIGNER (Type or print) | | | | 20A. NAME OF CONTRACTING OFFICER Andrea Dehne | | | |
| 19B. NAME OF CONTRACTOR | | 19C. DATE SIGNED | | 20B. UNITED STATES OF AMERICA | | 20C. DATE SIGNED | |
| BY (Signature of person authorized to sign) | | | | BY  (Signature of the Contracting Officer) | | ELECTRONIC SIGNATURE 01/09/2020 | |

CONTINUATION SHEET

REFERENCE NO. OF DOCUMENT BEING CONTINUED
EP-C-17-031/68HERC20F0095

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NAME OF OFFEROR OR CONTRACTOR

TETRA TECH, INC.

| ITEM NO. (A) | SUPPLIES/SERVICES (B) | QUANTITY (C) | UNIT (D) | UNIT PRICE (E) | AMOUNT (F) |
|-----------------|---|-----------------|-------------|-------------------|---------------|
| 0001 | <p>DUNS Number: 198549560 TOCOR: Christopher Clark Max Expire Date: 01/08/2021 Delivery: 01/08/2021 Accounting Info: 19-20-C-262W000-000F84-2532-26A6A-19262WC929-001 BFY: 19 EFY: 20 Fund: C Budget Org: 262W000 Program (PRC): 000F84 Budget (BOC): 2532 Cost: 26A6A DCN - Line ID: 19262WC929-001 Period of Performance: 01/09/2020 to 01/08/2021</p> <p>Task Order Issuance Line Item: Technical Support for EPA/ORD Ecological Assessment Programs</p> <p>Fully Funded Firm-Fixed-Price Task Order Delivery-Invoice Payment Schedule shall not exceed a frequency greater than once a month and 90% of the task order price. Acceptance for invoicing is based on deliverable approval by the TOCOR. For efficient processing IAW FAR clause 52.232-32, performance based payment invoicing amounts will not be submitted until the TOCOR provides deliverable approval. The TOCOR will notify Tetra Tech within 14 days of submission of a deliverable of EPAs intention to approve or disapprove.</p> <p>TOCOR: Christopher Clark/ (202) 564-4183/clark.christopher@epa.gov ALTOCOR: Jana Compton/ (541) 754-4620/compton.jana@epa.gov</p> | | | | 71,195.00 |

PERFORMANCE WORK STATEMENT
TETRA TECH, INC.
Contract #EP-C-17-031
PR-ORD-19-02371/SOL 68HERC20R0009
TO: 68HERC20F0095

I. Title: Next Generation of the Nitrogen and Phosphorus Inventories: Proposed Methodologies for Intermediate Products and Future Research Directions

II. EAS Short Title: National Nutrient Inventories, version 2.

III. Period of Performance: Date of TO award through 12 months following award

IV. Task Order COR:

Christopher M. Clark
U.S. Environmental Protection Agency Office of Research and Development
National Center for Environmental Assessment (8623-R)
1200 Pennsylvania Avenue, NW
Washington, DC 20460
202-564-4183
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Alternate Task Order COR:

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V. Introduction:

In collaboration with other research personnel from across the EPA Office of Research and Development (ORD), the EPA Exposure Analysis and Risk Characterization Group (EARCG) will develop annual nitrogen and phosphorus inventories across the contiguous United States for the 1987 to 2012 period using existing methodologies and databases. In addition, the inventories will also be updated to 2017 by replicating methodologies established in the literature thus allowing EPA to develop the capabilities to independently derive flux estimates when necessary raw data becomes available. It also will utilize spatial allocation procedures to downscale existing estimates of nutrient inputs and outputs to 30m resolution using the Multi-Resolution Land Characteristics Consortium National Land Cover Dataset and other ancillary data (<https://www.mrlc.gov/>). In parallel to this effort, EPA personnel will be developing novel methodologies to improve the estimates and allocation of specific nutrient fluxes while also developing the infrastructure to independently update the inventory with these new estimation procedures.

This task order proceeds in three iterative stages: 1) Compilation, 2) Temporal Interpolation and Spatial Allocation, and 3) Zonal Summation. The compilation step involves the acquisition of 1) existing datasets that either provide a direct estimate of the nutrient flux of interest or is a necessary input variable to derive a flux estimate (e.g., population estimate to get human food demand) and 2) descriptions of methodologies. Where possible, the contractor shall develop R or Python code capable of replicating these flux estimates and extend estimates up through 2017. The temporal interpolation and spatial allocation step involves the use of interpolation procedures to fill in temporal gaps for some flux estimates and deploying defensible spatial allocation procedures to down-scale specific nutrient fluxes to associated land uses. The third and final step, Zonal Summation, involves summarizing the nutrient inventories to various polygons of interest: HUC-12, USGS NAWQA Catchments, and potentially some political boundaries. The nutrient inventories will be summarized to the NHDPlusV2.1 catchment scale using zonal statistics. In addition to this,

accumulation of catchment scale zonal statistics using StreamCat methodology (i.e. <https://www.epa.gov/national-aquatic-resource-surveys/streamcat>) will be carried out by EPA personnel once the down-scaled 30m resolution is transferred to the TOCOR.

VI. Specific Tasks and Deliverables:

Task 1. Establish communication with the TOCOR and develop a QAPP

SubTask 1.1. Establish communication

Following the TO award, the Contractor shall schedule a series of bi-weekly conference calls (not to exceed 1 hour) or at the frequency established in consultation with the TOCOR, ~~with the TOCOR~~, relevant collaborators, and appropriate contractor staff to clarify outstanding questions and confirm the schedule and specific tasks. In collaboration with the TOCOR, the Contractor shall also establish a schedule for regular progress reports, project meetings, and other communications throughout the period of performance of this TO.

Deliverable 1.1.A: Kickoff call to discuss the project and set up a time for biweekly meetings. Due within one week of award.

Deliverable 1.1.B: Brief, written progress reports as email to the TOCOR. Due monthly or upon request by the TOCOR for the duration of this TO.

Deliverable 1.1.C: Project meetings and other communications, such as conference calls, as needed. Due upon request by the TOCOR for the duration of this TO.

SubTask 1.2. Development of a QAPP

All work conducted under this TO shall be performed pursuant to an EPA approved Quality Assurance Project Plan (QAPP). The contractor shall develop a QAPP within three (3) weeks following TO award for review and approval by the TOCOR and the EPA QA Manager as well as Marc Weber and Ryan Hill, managers of StreamCat. The Contractors may modify existing QAPPs as appropriate (e.g. QAPP#: B-DC-0031839-QP-1-0). The QAPP shall describe the application of QA and QC activities for the project under this Performance Work Statement (PWS). The QAPP shall be developed in accordance with EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5) (EPA/240/B-01/003, 03/20/01), available at: <http://www.epa.gov/quality/qs-docs/r5-final.pdf>. Additional guidance for QAPP development specific to model evaluation can be found in the document Guidance for Quality Assurance Project Plans for Modeling (EPA QA/G-5M) (EPA/240/R-02/005, December 2002) available at: <http://www.epa.gov/quality/qs-docs/g5m-final.pdf>. Guidance for projects using geospatial data can be found in the document: Guidance for Geospatial Data Quality Assurance Project Plans (EPA QA/G-5G) (EPA/240/R-03/003) available at: <http://www.epa.gov/quality/qs-docs/g5g-final.pdf>. The QAPP must address data collection, analysis, and the use of existing (secondary) data if existing data will be used in this project. The Contractor shall not perform any work on subsequent tasks under this PWS until the QAPP are reviewed and approved.

Deliverable 1.2.A: A draft QAPP submitted to the TOCOR and QA Manager for review. Due three (3) weeks after being issued the TO.

Deliverable 1.2.B: A revised QAPP addressing TOCOR comments on the draft submitted to the TOCOR for approval. Due one (1) week after receiving comments on Deliverable 1.2.A.

Task 2. Compilation of existing databases and methodologies and development of code to extend current inventory estimates through 2017

SubTask 2.1. Compilation of existing databases and methodologies

Contractor shall compile existing datasets and relevant reports instrumental to developing the nitrogen and phosphorus inventories for the period 1987-2017. The compilation step involves the download of 1) existing datasets that either provide a direct estimate of the nutrient flux of interest or is a necessary input variable to derive a flux estimate (e.g.,

population estimate to get human food demand) and 2) descriptions of methodologies (e.g., associated meta-data or papers). TOCOR will provide specific links (also below) to reports and databases required to be part of the proposed inventory below. Deliverable shall be completed within one (1) month of approval of Deliverable 1.2.B.

Deliverable 2.1.A: Datasets include:

1. Human N and P food demand and waste, human P non-food demand and waste
 - 1.1. Population Density Rasters for 1990, 2000, and 2010
 - 1.1.1. (Falcone, USGS, <https://www.sciencebase.gov/catalog/item/57753cbcc4b07dd077c70868>)
 - 1.1.2. Constants provided by TOCOR
2. Total Atmospheric NO_x, NH_x, and N Deposition 2000-2016
 - 2.1. TDEP rasters
 - 2.1.1. (<http://nadp.slh.wisc.edu/committees/tdep/tdepmaps/>)
 - 2.1.1.1. Coordinate with TOCOR on timing of acquisition as TDEP is currently being updated.
3. Total Atmospheric NO_x, NH_x, and N Deposition 1990-2010
 - 3.1. CMAQ estimates (<https://www.atmos-chem-phys.net/18/9091/2018/>)
 - 3.1.1. Provided by TOCOR
4. Farm/Urban N and P Fertilizer Use
 - 4.1. USGS County Fertilizer Estimates (1987-2012)
 - 4.1.1. <https://www.sciencebase.gov/catalog/item/5851b2d1c4b0f99207c4f238>
5. Natural N Fixation
 - 5.1. CASA-CNP Model 2000-2010 Raster
 - 5.1.1. Provided by TOCOR
6. Rock Weathering
 - 6.1. Houlton et al. 2018 (<https://science.sciencemag.org/content/360/6384/58>)
 - 6.1.1. Provided by TOCOR
7. Livestock N and P Demand, Production, and Waste
 - 7.1. NANI/NAPI Toolbox
 - 7.1.1. <http://www.ccb.cornell.edu/biogeo/nanc/nani/nani.htm>
 - 7.1.2. <https://www.sciencedirect.com/science/article/pii/S2352340919306195>
 - 7.1.3. <https://www.sciencedirect.com/science/article/pii/S2352340918304517>
8. Livestock N and P Excretion and Waste Recovered
 - 8.1. IPNI NuGIS (only AG Census Years-1987, 1992, 1997, 2002, 2007, and 2012)
 - 8.1.1. <http://nugis.ipni.net/About%20NuGIS/>
9. Crop N and P removal
 - 9.1. NANI/NAPI Toolbox
 - 9.1.1. <http://www.ccb.cornell.edu/biogeo/nanc/nani/nani.htm>
 - 9.1.2. <https://www.sciencedirect.com/science/article/pii/S2352340919306195>
 - 9.1.3. <https://www.sciencedirect.com/science/article/pii/S2352340918304517>
 - 9.2. IPNI NuGIS (only AG Census Years-1987, 1992, 1997, 2002, 2007, and 2012)
 - 9.2.1. <http://nugis.ipni.net/About%20NuGIS/>
10. Agricultural N₂O Emissions
 - 10.1. Method 1: IPCC Tier I Approach with farm fertilizer and livestock waste data listed above and land use data
 - 10.1.1. Methodologies to do simple tabular calculations will be developed in consultation with TOCOR, please refer to (https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_11_Ch11_N2O&CO2.pdf)
 - 10.2. Method 2: Estimates from the DayCent model (<https://www2.nrel.colostate.edu/projects/daycent/>)
11. Agricultural Denitrification
 - 11.1. Apply N₂O/N₂ ratio (simple tabular calculation)
 - 11.1.1. Methodology will be developed in consultation with TOCOR
12. Lightning (NO_x) and Forest Fire Emissions (NO_x and NH_x), 2000-2017
 - 12.1. NEI/CMAQ/SMARTFIRE
 - 12.1.1. 12-km grid data will be provided for a subset of years by the TOCOR

13. Areal NO_x and NH_x, animal NO_x and NH_x, fertilizer NH_x, on-road NO_x and NH_x, biogenic NO, and point NO_x and NH_x emissions
 - 13.1. Point and County National Emissions Inventory Estimates (1990, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2005, 2008, 2011, 2014, and 2016)
 - 13.1.1. <https://www.epa.gov/air-emissions-inventories/national-emissions-inventory-nci>
 - 13.2. CMAQ Grid Input Data
 - 13.2.1. 12-km grid data will be provided by the TOCOR for a subset of years post-2000
14. N-Fixing Crop Cultivation
 - 14.1. IPNI NuGIS (1987, 1992, 1997, 2002, 2007, 2012)
 - 14.1.1. <http://nugis.ipni.net/About%20NuGIS/>
 - 14.2. NANI Toolbox
 - 14.2.1. <http://www.ccb.cornell.edu/biogeo/nanc/nani/nani.htm>
 - 14.2.2. <https://www.sciencedirect.com/science/article/pii/S2352340918304517>
15. Point Source N and P Load (2007 and onward)
 - 15.1. Hypoxia Task Force Point Source Loading Tool
 - 15.1.1. <https://echo.epa.gov/trends/loading-tool/hypoxia-task-force-annual-loading>
 - 15.1.2. Consult TOCOR for automation of QA/QC procedures
16. High and low pesticide P and N Use
 - 16.1. USGS “Estimated Annual Pesticide Use Database” (1992-2012)
 - 16.1.1. <https://water.usgs.gov/nawqa/pnsp/usagc/maps/about.php>
 - 16.1.2. TOCOR will provide list of no more than 10 chemicals to pursue
17. Total Atmospheric P Deposition
 - 17.1. LMDZ-INCA (<https://onlinelibrary.wiley.com/doi/full/10.1111/gcb.13766>)
 - 17.1.1. ASCII files will be provided by TOCOR
18. Non-inventory databases
 - 18.1. 2016 NLCD Mapping Products
 - 18.2. 1992 NLCD
 - 18.3. 2018 USDA National Resources Inventory (NRI, county-level provided by TO-COR).
 - 18.4. NWALT (<https://pubs.er.usgs.gov/publication/ds948>)
 - 18.5. USDA Cropland Data Layers (2007-onward; https://www.nass.usda.gov/Research_and_Science/Cropland/Release/index.php)
 - 18.6. USGS NAWQA catchments (<https://pubs.er.usgs.gov/publication/sir20175006>)
19. Legacy N and P Agricultural Surplus (1945-2017)
 - 19.1. Yang et al. livestock population data
 - 19.1.1. Tabular data provided by TOCOR
 - 19.2. Historic Fertilizer data (Alexander and Smith, 1990)
 - 19.2.1. <https://pubs.er.usgs.gov/publication/ofr90130>
 - 19.3. Historic Crop N and P Removal, if data feasible consult with TOCOR
 - 19.3.1. Replicate methods outlined in approaches listed in Deliverable 3.2.A item 9
 - 19.3.2. <http://nugis.ipni.net/About%20NuGIS/>
 - 19.3.3. <http://www.ccb.cornell.edu/biogeo/nanc/nani/nani.htm>
 - 19.3.4. https://www.nass.usda.gov/Data_and_Statistics/index.php

SubTask 2.2. Developing query procedures and code to replicate select methodologies and extend inventory estimates to 2017

In consultation with the TOCOR, Contractor shall develop query procedures for USDA’s Quickstat database to acquire needed raw data to develop flux estimates associated with agricultural production, as well R and/or python code that replicates methodologies described in Subtask 2.1 to extend the nitrogen and phosphorus inventories to 2017. Code to replicate other datasets shall also be requested, but an updated estimate is not necessarily doable since the necessary input data may not yet be available (e.g., 2020 US Census Data). Deliverable 2.2 shall be completed within one (1) month of TO subtask 2.1.

Deliverable 2.2.A: Query procedures on QuickStat to extract necessary data (1987-2017) to estimate farm/urban fertilizer use, livestock production (all associated fluxes), crop N and P removal, N-fixing crop cultivation, and N₂O + N₂ emissions.

Deliverable 2.2.B: Develop code (R and/or Python) capable of replicating agricultural flux estimates as outlined in Deliverable 2.2.A and provide an updated estimate for 2017. Develop code capable of generating population density estimates using Census data and applying relevant constants to estimate human nutrient demand and waste estimates (as documented in Deliverable 2.1.A).

Task 3. Filling in temporal gaps and down-scaling the inventory

SubTask 3.1. Filling in temporal gaps via linear interpolation

Contractor shall generate continuous time series for all datasets listed in Deliverable 2.1.A using linear interpolation. In consultation with the TOCOR, contractor shall also carry out reasonable extrapolations to reach the beginning and end of the Inventory period where appropriate (i.e., 1987 and 2017). The Contractor shall also add a field in the database to identify if the given year of data is interpolated or from raw data, separately for each flux and dataset.

Deliverable 3.1.A: Generate continuous estimates of inventory fluxes described in Deliverable 2.1.A for the 1987-2017 period using linear interpolation and extrapolation procedures. TOCOR will provide an appendix table that summarizes current years available for each of the databases, but this table will be updated following the completion of deliverables in Task 2. The tabular database with all annual estimates shall be provided within one (1) month of TOCOR approval of Task 2.2.B.

Deliverable 3.1.B: Code and written methodologies to carry out interpolation/extrapolation procedures. Completed within two (2) weeks of TOCOR approval of Task 3.1.A.

SubTask 3.2. Down-scaling and spatially allocating the inventory

Contractor shall use down-scaling procedures outlined below to spatially allocate nitrogen and phosphorus inputs and outputs using the Multi-Resolution Land Characteristics Consortium (MRLC) National Land Cover Dataset and other ancillary data as well as the MTBS burned area datasets. Contractor is to consult with TOCOR and relevant collaborators to optimize the allocation procedure. Table 1 list the inventory years that will be associated to specific years of the MRLC data products. Spatial resolution for all these layers are specified in the list of layers below, but generally 30x30 meter is the preferred resolution. The down-scaled rasters and code to generate these rasters shall be provided to EPA within eight (8) weeks of approval of Task 2.2.B.

Table 1. Temporal matching between inventory fluxes and available NLCDs for spatial allocation procedures.

| NLCD Version | NLCD Year | Inventory Years |
|--------------|-----------|-----------------|
| 1992 | 1992 | 1987-1997 |
| 2016 | 2001 | 1998-2001 |
| 2016 | 2003 | 2002-2004 |
| 2016 | 2006 | 2005-2006 |
| 2016 | 2008 | 2007-2009 |
| 2016 | 2011 | 2010-2011 |
| 2016 | 2013 | 2012-2014 |
| 2016 | 2016 | 2015-2017 |

Deliverable 3.2.A: Contractor shall spatially allocate nitrogen and phosphorus fluxes using the following NLCD land cover classes as well as other relevant spatial classification data products and subsequently calculate derived metrics on a per pixel basis. In addition, contractor shall allocate post-2012 estimates developed in SubTask 2.2.B. Due within six (6) weeks of approval of Task 2.2.B. These include:

1. Human N and P food demand and waste, human P non-food demand and waste
 - 1.1. Developed: Low, Medium, and High Intensity (22-24)
2. Total Atmospheric NO_x, NH_x, and N Deposition 2000-2016
 - 2.1. TDEP rasters
 - 2.1.1. No reallocation needed, just resample to 30m resolution
3. Total Atmospheric NO_x, NH_x, and N Deposition 1990-2010
 - 3.1. DOE estimates (<https://www.atmos-chem-phys.net/18/9091/2018/>)
 - 3.1.1. No reallocation needed, just resample to 30m resolution
4. Farm/Urban N and P Fertilizer Use
 - 4.1. USGS County Fertilizer Estimates (1987-2012)
 - 4.1.1. Agricultural Lands – Method 1: Pasture/hay and cultivated crops (81-82)
 - 4.1.2. Agricultural Lands – Method 2: In consultation with the TO-COR, use the Cropland Datalayer to apply crop-specific and state-specific rates for the four crops for which information is available (i.e. corn, wheat, soy, cotton) <https://www.ers.usda.gov/data-products/fertilizer-use-and-price.aspx>
 - 4.1.3. Urban/Developed Lands (21-23)
5. Natural N Fixation
 - 5.1. CASA-CNP Model 2000-2010 Raster
 - 5.1.1. Mask using Unconsolidated shore (32), Forest (41-43), Barren Land (31), Shrubs (51-52), Herbaceous (71-72), Wetlands (90, 95)
6. Rock Weathering
 - 6.1. Houlton et al. 2018 (<https://science.sciencemag.org/content/360/6384/58>)
 - 6.1.1. No reallocation needed, just resample to 30m resolution
7. Livestock N and P Demand, Production, and Waste
 - 7.1. NANI/NAPI Toolbox
 - 7.1.1. Agricultural Lands: Pasture/hay and cultivated crops (81-82)
8. Livestock N and P Waste Recovered
 - 8.1. IPNI NuGIS (only AG Census Years-1987, 1992, 1997, 2002, 2007, and 2012)
 - 8.1.1. Agricultural Lands: Pasture/hay and cultivated crops (81-82)
9. Crop N and P removal
 - 9.1. NANI/NAPI Toolbox
 - 9.1.1. Agricultural Lands: Pasture/hay and cultivated crops (81-82)
 - 9.2. IPNI NuGIS (only AG Census Years-1987, 1992, 1997, 2002, 2007, and 2012)
 - 9.2.1. Agricultural Lands: Pasture/hay and cultivated crops (81-82)
10. Agricultural N₂O Emissions
 - 10.1. IPCC Tier I Approach with farm fertilizer and livestock waste data listed above and land use data
 - 10.1.1. Agricultural Lands: Pasture/hay and cultivated crops (81-82)
11. Agricultural Denitrification
 - 11.1. Apply N₂O/N₂ ratio (simple tabular calculation)
 - 11.1.1. Agricultural Lands: Pasture/hay and cultivated crops (81-82)
12. Lightning (NO_x) and Forest Fire Emissions (NO_x and NH_x), 2000-2017
 - 12.1. NEI/CMAQ- Lightning
 - 12.1.1. Resample to 30m resolution
 - 12.2. NEI/CMAQ/SMARTFIRE
 - 12.2.1. Burned areas as outlined by MTBS, NLCD codes will be determined in consultation with TOCOR
13. Areal emissions of NO_x and NH_x, animal NO_x and NH_x, fertilizer NH_x, on-road NO_x and NH_x, biogenic NO, and point NO_x and NH_x
 - 13.1. Areal NO_x and NH_x
 - 13.1.1. Resample to 30m resolution
 - 13.2. Animal NO_x and NH_x and fertilizer NH_x
 - 13.2.1. Agricultural Lands: Pasture/hay and cultivated crops (81-82)
 - 13.3. On-road NO_x and NH_x
 - 13.3.1. Classified “roads” from MRLC impervious surface database
 - 13.4. Biogenic NO

- 13.4.1. Resample to 30m resolution
- 13.5. Point NO_x and NH_x emissions
 - 13.5.1. Latitude and longitude listed in database
- 14. N-Fixing Crop Cultivation
 - 14.1. IPNI NuGIS (1987, 1992, 1997, 2002, 2007, 2012)
 - 14.1.1. Agricultural Lands: Pasture/hay and cultivated crops (81-82)
 - 14.2. NANI Toolbox
 - 14.2.1. Agricultural Lands: Pasture/hay and cultivated crops (81-82)
- 15. Point Source N and P Load (2007 and onward)
 - 15.1. Hypoxia Task Force Point Source Loading Tool
 - 15.1.1. Latitude and longitude listed in database
- 16. High and low pesticide P and N Use
 - 16.1. USGS “Estimated Annual Pesticide Use Database” (1992-2012)
 - 16.1.1. Agricultural Lands: Pasture/hay and cultivated crops (81-82)
- 17. Total Atmospheric P Deposition
 - 17.1. LMDZ-INCA (<https://onlinelibrary.wiley.com/doi/full/10.1111/gcb.13766>)
 - 17.1.1. Resample to 30m resolution
- 18. Non-inventory databases
 - 18.1. 2016 NLCD Mapping Products
 - 18.2. 1992 NLCD
 - 18.3. Annual and Seasonal PRISM Climate Data (<http://www.prism.oregonstate.edu/recent/>)
- 19. Derived metrics (additive, simple raster calculator functions) per pixel, TOCOR will provide the definitions
 - 19.1. NANI and NAPI
 - 19.2. Terrestrial N and P Surplus
 - 19.3. Total Nitrogen and Phosphorus Inputs
 - 19.4. Total Nitrogen and Phosphorus Outputs
 - 19.5. Agricultural N and P Surplus
 - 19.6. Nitrogen and Phosphorus Use Efficiency on Agricultural Lands

Deliverable 3.2.B: Methodologies and code to allocate N and P fluxes from databases compiled in deliverable 3.2.A. Due one (1) week after approval of 3.2.A.

Task 4. Summarizing annual nutrient inventories at multiple scales and trends assessment

Contractor shall carry out zonal statistic procedures to summarize nutrient inventories at HUC-12, HUC-8, and county scales. This data will be used as input data for a future online tool. Zonal statistics will also be carried for all USGS NAWQA catchments (watershed delineations are publicly available) and other boundaries may be considered based on stakeholder feedback and available resources. In addition, EPA personnel will summarize nutrient inventories developed in Deliverable 3.2.A using STREAMCAT algorithms to aggregate at the NHDPlusV2.1 catchment scale. In coordination with the TOCOR, EPA STREAMCAT personnel, and contractor shall coordinate QA/QC procedures to ensure summarized dataset across the contiguous United States are consistent. Tabular databases are due two (2) months after approval of Deliverable 3.2.B (Deliverable 4.A and Deliverable 4.B), while reports and trend results (Deliverables 4.C and 4.D) are due one (1) month after approval of Deliverables 4.A and 4.B.

Deliverable 4.A: HUC-8, HUC-12, and county tabular databases containing annual estimates of all nutrient fluxes and derived metrics listed in Deliverable 3.2.A, PRISM data, and NLCD land use acreage.

Deliverable 4.B: NAWQA tabular database with inventory fluxes and derived metrics as well climate and land use data matched with annual WRTDS output (1987-2012)

Deliverable 4.C: Brief QA/QC report between StreamCat summation (provided by EPA personnel), databases from Deliverable 4.A, and native estimates from Deliverable 2.1.A. Code and methodologies must also be provided.

Deliverable 4.D: Provide a summary of trends for inventory and climatic variable for the periods 1987-2017, 1987-2002, and 2002-2017. A conservative non-parametric (e.g., Mann-Kendall) or bootstrapping procedure shall be deployed.

VII. Schedule of Deliverables

| Task # | SubTask | Deliverable | Due Date | Schedule from date of award (weeks) |
|--------|---------|----------------------------------|---|-------------------------------------|
| 1 | 1.1 | Establish communication | Due 1 week after TO award | 1 |
| 1 | 1.2.A | Draft QAPP | Due 3 weeks after TO award | 3 |
| 1 | 1.2.B | Final QAPP | Due 1 week after approval of Deliverable 1.2.A | 4 |
| 2 | 2.1.A | Inventory datasets | Due one month after approval of Deliverable 1.2.B. | 8 |
| 2 | 2.2.A | Query Procedures | Due one month after approval of Deliverable 2.1.? | 12 |
| 2 | 2.2.B | Code for flux estimates | Due one month after approval of Deliverable 2.1.? | 12 |
| 3 | 3.1.A | Interpolation/Extrapolation | Due one month after approval of Deliverable 2.2.B | 16 |
| 3 | 3.1.B | Interpolation/Extrapolation code | Due 2 weeks after approval of Deliverable 3.1.A | 18 |
| 3 | 3.2.A | Spatial allocation | Due two months after approval of Deliverable 2.2.B | 20 |
| 3 | 3.2.B | Spatial allocation code | Due 1 week after approval of Deliverable 3.2.A | 21 |
| 4 | 4.A | HUC and county summaries | 2 month after approval of Deliverable 3.2.B | 29 |
| 4 | 4.B | NAWQA tabular database | 2 months after approval of Deliverable 3.2.B | 29 |
| 4 | 4.C | QA/QC report | Due 1 month after approval of Deliverables 4.A and 4.B. | 33 |
| 4 | 4.D | Trends assessment | Due 1 month after approval of Deliverables 4.A and 4.B. | 33 |

VIII. Acceptance Criteria:

The Contractor shall prepare high quality deliverables. Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be reasonably complete and presented in a logical, readable manner. Figures submitted shall be of high quality, similar to those in presentations developed for national scientific meetings and should be formatted as jpeg or png files. Additional requirements specific to this TO are as follows: Electronic deliverables must be in an original file format that can be supported by EPA after the end of the Period of Performance of the TO. The standard office software at EPA is MS Office. Text deliverables shall be provided in Microsoft Word 2016 or Excel or compatible format.

NAME OF OFFEROR OR CONTRACTOR
TETRA TECH, INC.

| ITEM NO. (A) | SUPPLIES/SERVICES (B) | QUANTITY (C) | UNIT (D) | UNIT PRICE (E) | AMOUNT (F) |
|-----------------|--|-----------------|-------------|-------------------|---------------|
| | TOCOR will notify Tetra Tech within 14 days of submission of a deliverable of EPAs intention to approve or disapprove. TOCOR: Christopher Clark/(202)564-4183/clark.christopher@epa.gov ALTOCOR: Jana Compton/(541)754-4620/compton.jana@epa.gov | | | | |

| | | | | | | | |
|--|--|---------------------------------|--|--|---|----|-------|
| AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT | | | 1. CONTRACT ID CODE | | PAGE | OF | PAGES |
| 2. AMENDMENT/MODIFICATION NUMBER | | 3. EFFECTIVE DATE 08/13/2020 | 4. REQUISITION/PURCHASE REQUISITION NUMBER | | 5. PROJECT NUMBER (If applicable) | | |
| 6. ISSUED BY Raoul D. Scott, Director OMS/ARM/OAS/Policy, Training and Oversight Division US Environmental Protection Agency, Mail Code 3802R 1200 Pennsylvania Avenue, NW Washington, DC 20004 | | CODE | 7. ADMINISTERED BY (If other than Item 6) | | CODE | | |
| 8. NAME AND ADDRESS OF CONTRACTOR (Number, street, county, State and ZIP Code) To All EPA Contractors | | | <input checked="" type="checkbox"/> (X) | | 9A. AMENDMENT OF SOLICITATION NUMBER | | |
| | | | <input type="checkbox"/> | | 9B. DATED (SEE ITEM 11) | | |
| | | | <input checked="" type="checkbox"/> (X) | | 10A. MODIFICATION OF CONTRACT/ORDER NUMBER To all EPA Contracts and Orders | | |
| | | | <input type="checkbox"/> | | 10B. DATED (SEE ITEM 13) | | |
| CODE | | FACILITY CODE | | | | | |

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended. ☐ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:
 (a) By completing items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted;
 or (c) By separate letter or electronic communication which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by letter or electronic communication, provided each letter or electronic communication makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

**13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.
IT MODIFIES THE CONTRACT/ORDER NUMBER AS DESCRIBED IN ITEM 14.**

| | |
|-------------------------------------|---|
| CHECK ONE | A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NUMBER IN ITEM 10A. |
| <input type="checkbox"/> | |
| <input checked="" type="checkbox"/> | B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation data, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b). |
| <input type="checkbox"/> | C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: |
| <input type="checkbox"/> | D. OTHER (Specify type of modification and authority) |

E. IMPORTANT: Contractor ☒ is not ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

This contract/order is being modified in accordance with the applicability instructions in interim FAR Case 2019-009, and FAR 4.2105, requiring contracting officers to include FAR clause 52.204-25, Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment.

See attached for the full text version of FAR 52.204-25. Contractor Acknowledgment of receipt required.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

| | | | |
|---|------------------|--|------------------|
| 15A. NAME AND TITLE OF SIGNER (Type or print) | | 16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Raoul D. Scott, Director Policy, Training and Oversight Division | |
| 15B. CONTRACTOR/OFFEROR | 15C. DATE SIGNED | 16B. UNITED STATES OF AMERICA RAOUL SCOTT Digitally signed by RAOUL SCOTT Date: 2020.07.30 11:40:17 -04'00' | 16C. DATE SIGNED |
| (Signature of person authorized to sign) | | (Signature of Contracting Officer) | |

Previous edition unusable

52.204-25 Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment.

As prescribed in 4.2105(b) and in the applicability instructions in interim FAR Case 2019-009, insert the following clause:

Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment (Aug 2020)

(a) Definitions. As used in this clause—

Backhaul means intermediate links between the core network, or backbone network, and the small subnetworks at the edge of the network (e.g., connecting cell phones/towers to the core telephone network). Backhaul can be wireless (e.g., microwave) or wired (e.g., fiber optic, coaxial cable, Ethernet).

Covered foreign country means The People's Republic of China.

Covered telecommunications equipment or services means—

(1) Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities);

(2) For the purpose of public safety, security of Government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities);

(3) Telecommunications or video surveillance services provided by such entities or using such equipment; or

(4) Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

Critical technology means—

(1) Defense articles or defense services included on the United States Munitions List set forth in the International Traffic in Arms Regulations under subchapter M of chapter I of title 22, Code of Federal Regulations;

(2) Items included on the Commerce Control List set forth in Supplement No. 1 to part 774 of the Export Administration Regulations under subchapter C of chapter VII of title 15, Code of Federal Regulations, and controlled-

(i) Pursuant to multilateral regimes, including for reasons relating to national security, chemical and biological weapons proliferation, nuclear nonproliferation, or missile technology; or

(ii) For reasons relating to regional stability or surreptitious listening;

(3) Specially designed and prepared nuclear equipment, parts and components, materials, software, and technology covered by part 810 of title 10, Code of Federal Regulations (relating to assistance to foreign atomic energy activities);

(4) Nuclear facilities, equipment, and material covered by part 110 of title 10, Code of Federal Regulations (relating to export and import of nuclear equipment and material);

(5) Select agents and toxins covered by part 331 of title 7, Code of Federal Regulations, part 121 of title 9 of such Code, or part 73 of title 42 of such Code; or

(6) Emerging and foundational technologies controlled pursuant to section 1758 of the Export Control Reform Act of 2018 (50 U.S.C. 4817).

Interconnection arrangements means arrangements governing the physical connection of two or more networks to allow the use of another's network to hand off traffic where it is ultimately delivered (e.g., connection of a customer of telephone provider A to a customer of telephone company B) or sharing data and other information resources.

Reasonable inquiry means an inquiry designed to uncover any information in the entity's possession about the identity of the producer or provider of covered telecommunications equipment or services used by the entity that excludes the need to include an internal or third-party audit.

Roaming means cellular communications services (e.g., voice, video, data) received from a visited network when unable to connect to the facilities of the home network either because signal coverage is too weak or because traffic is too high.

Substantial or essential component means any component necessary for the proper function or performance of a piece of equipment, system, or service.

(b) Prohibition. (1) Section 889(a)(1)(A) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (Pub. L. 115-232) prohibits the head of an executive agency on or after August 13, 2019, from procuring or obtaining, or extending or renewing a contract to procure or obtain, any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. The Contractor is prohibited from providing to the Government any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system, unless an exception at paragraph (c) of this clause applies or the covered telecommunication equipment or services are covered by a waiver described in FAR 4.2104.

(2) Section 889(a)(1)(B) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (Pub. L. 115-232) prohibits the head of an executive agency on or after August 13, 2020, from entering into a contract, or extending or renewing a contract, with an entity that uses any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system, unless an exception at paragraph (c) of this clause applies or the covered telecommunication equipment or services are covered by a waiver described in FAR 4.2104. This prohibition applies to the use of covered telecommunications equipment or services, regardless of whether that use is in performance of work under a Federal contract.

(c) *Exceptions.* This clause does not prohibit contractors from providing—

(1) A service that connects to the facilities of a third-party, such as backhaul, roaming, or interconnection arrangements; or

(2) Telecommunications equipment that cannot route or redirect user data traffic or permit visibility into any user data or packets that such equipment transmits or otherwise handles.

(d) Reporting requirement.

(1) In the event the Contractor identifies covered telecommunications equipment or services used as a substantial or essential component of any system, or as critical technology as part of any system, during contract performance, or the Contractor is notified of such by a subcontractor at any tier or by any other source, the Contractor shall report the information in paragraph (d)(2) of this clause to the Contracting Officer, unless elsewhere in this contract are established procedures for reporting the information; in the case of the Department of Defense, the Contractor shall report to the website at <https://dibnet.dod.mil>. For indefinite delivery contracts, the Contractor shall report to the Contracting Officer for the indefinite delivery contract and the Contracting Officer(s) for any affected order or, in the case of the Department of Defense, identify both the indefinite delivery contract and any affected orders in the report provided at <https://dibnet.dod.mil>.

(2) The Contractor shall report the following information pursuant to paragraph (d)(1) of this clause

(i) Within one business day from the date of such identification or notification: the contract number; the order number(s), if applicable; supplier name; supplier unique entity identifier (if known); supplier Commercial and Government Entity (CAGE) code (if known); brand; model number (original equipment manufacturer number, manufacturer part number, or wholesaler number); item description; and any readily available information about mitigation actions undertaken or recommended.

(ii) Within 10 business days of submitting the information in paragraph (d)(2)(i) of this clause: any further available information about mitigation actions undertaken or recommended. In addition, the Contractor shall describe the efforts it undertook to prevent use or submission of covered telecommunications equipment or services, and any additional efforts that will be incorporated to prevent future use or submission of covered telecommunications equipment or services.

(e) *Subcontracts*. The Contractor shall insert the substance of this clause, including this paragraph (e) and excluding paragraph (b)(2), in all subcontracts and other contractual instruments, including subcontracts for the acquisition of commercial items.

(End of clause)

| | | | | | | | |
|---|---|-------------------|--|--|--|--------------------------------|--|
| AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT | | | | 1. CONTRACT ID CODE | | PAGE OF PAGES | |
| | | | | | | 1 2 | |
| 2. AMENDMENT/MODIFICATION NO. | | 3. EFFECTIVE DATE | | 4. REQUISITION/PURCHASE REQ. NO. | | 5. PROJECT NO. (If applicable) | |
| P00002 | | See Block 16C | | PR-ORD-21-00331 | | | |
| 6. ISSUED BY | | CODE | | 7. ADMINISTERED BY (If other than Item 6) | | CODE | |
| CAD | | | | | | | |
| CAD US Environmental Protection Agency 26 West Martin Luther King Drive Mail Code: W136 Cincinnati OH 45268-0001 | | | | | | | |
| 8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code) | | | | (x) 9A. AMENDMENT OF SOLICITATION NO. | | | |
| TETRA TECH, INC. Attn: John Hochheimer 10306 EATON PL STE 340 FAIRFAX VA 22030 | | | | | | | |
| | | | | 9B. DATED (SEE ITEM 11) | | | |
| | | | | x 10A. MODIFICATION OF CONTRACT/ORDER NO. EP-C-17-031 68HERC20F0095 | | | |
| | | | | 10B. DATED (SEE ITEM 13) 01/09/2020 | | | |
| CODE 198549560 | | FACILITY CODE | | | | | |
| 11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS | | | | | | | |
| <input type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers <input type="checkbox"/> is extended. <input type="checkbox"/> is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or electronic communication which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by letter or electronic communication, provided each letter or electronic communication makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified. | | | | | | | |
| 12. ACCOUNTING AND APPROPRIATION DATA (If required) See Schedule | | | | | | | |
| 13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14. | | | | | | | |
| CHECK ONE | A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A. | | | | | | |
| | B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation data, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b). | | | | | | |
| | C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: | | | | | | |
| X | D. OTHER (Specify type of modification and authority) BILATERAL AGREEMENT - NO COST/PRICE POP EXTENSION | | | | | | |
| E. IMPORTANT: Contractor <input type="checkbox"/> is not <input checked="" type="checkbox"/> is required to sign this document and return <u>1</u> copies to the issuing office. | | | | | | | |
| 14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) | | | | | | | |
| DUNS Number: 198549560 | | | | | | | |
| TOCOR: Christopher Clark Max Expire Date: 03/08/2021 | | | | | | | |
| LIST OF CHANGES: | | | | | | | |
| Reason for Modification: Other Administrative Action - No cost/price PoP extension to provide some more time for QA/QC of the datasets required for completion of Task 3 and 4. | | | | | | | |
| Period Of Performance End Date changed from 08-JAN-21 to 08-MAR-21 | | | | | | | |
| Total Amount for this Modification: \$0.00 | | | | | | | |
| New Total Amount for this Version: \$71,195.00 | | | | | | | |
| New Total Amount for this Award: \$71,195.00 | | | | | | | |
| Maximum Potential Expiration Date changed to : 03/08/2021 | | | | | | | |
| Continued ... | | | | | | | |
| Except as provided herein, all terms and conditions of the document referenced in Item 9 A or 10A, as heretofore changed, remains unchanged and in full force and effect. | | | | | | | |
| 15A. NAME AND TITLE OF SIGNER (Type or print) | | | | 16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) | | | |
| | | | | Andrea Dehne | | | |
| 15B. CONTRACTOR/OFFEROR | | 15C. DATE SIGNED | | 16B. UNITED STATES OF AMERICA | | 16C. DATE SIGNED | |
| (Signature of person authorized to sign) | | | |  (Electronic Signature) (Signature of Contracting Officer) | | 12/15/2020 | |

| | | | |
|---------------------------|---|------|----|
| CONTINUATION SHEET | REFERENCE NO. OF DOCUMENT BEING CONTINUED | PAGE | OF |
| | EP-C-17-031/68HERC20F0095/P00002 | 2 | 2 |

NAME OF OFFEROR OR CONTRACTOR
TETRA TECH, INC.

| ITEM NO. (A) | SUPPLIES/SERVICES (B) | QUANTITY (C) | UNIT (D) | UNIT PRICE (E) | AMOUNT (F) |
|-----------------|---|-----------------|-------------|-------------------|---------------|
| | <p>CHANGES FOR LINE ITEM NUMBER: 1 End Date changed from 08-JAN-21 to 08-MAR-21</p> <p>CHANGES FOR DELIVERY LOCATION: ORD DC Delivery Date changed from 01/08/2021 to 03/08/2021</p> <p>Payment: RTP Finance Center US Environmental Protection Agency RTP-Finance Center (AA216-01) 109 TW Alexander Drive www2.epa.gov/financial/contracts Durham NC 27711</p> <p>Period of Performance: 01/09/2020 to 03/08/2021 Delivery-Invoice Payment Schedule shall not exceed a frequency greater than once a month and 90% of the task order price. Acceptance for invoicing is based on deliverable approval by the TOCOR. For efficient processing IAW FAR clause 52.232-32, performance based payment invoicing amounts will not be submitted until the TOCOR provides deliverable approval. The TOCOR will notify Tetra Tech within 14 days of submission of a deliverable of EPAs intention to approve or disapprove.</p> <p>TOCOR: Christopher Clark/(202)564-4183/clark.christopher@epa.gov ALTOCOR: Jana Compton/(541)754-4620/compton.jana@epa.gov</p> | | | | |